



## GRX Online Retroreflectivity Sensor

### User Manual

Online sensor for production line control of the retroreflection properties of traffic sign sheeting materials.



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Manual November 2020 ver. 1.4 - English

## USA Statement

### Note:

GRX Online has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Canada Statement

### Note:

GRX Online complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage; et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### Intended use/purpose

GRX Online is an industrial online sensor for quality control of retroreflective sheeting materials on indoor production line.

### Important Safety and Handling Information

**Caution:** Changes/modifications not approved by the DELTA could void the user's authority to operate the equipment.

### Disposal and Recycling Information



Please ask DELTA concerning disposal of GRX Online in your country.

## Disclaimer

The information contained in this document is subject to change without notice.

DELTA MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. DELTA SHALL NOT BE LIABLE FOR ERRORS CONTAINED HEREIN OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, PERFORMANCE OR USE OF THIS MATERIAL.

Visit our web-site: <http://roadsensors.madebydelta.com/>

# Supplier's Declaration of Conformity (SDoC)

Unique identification of this SDoC: 80\_GRX Online Sensor\_SDoC\_001

*We,*

FORCE Technology  
Venlighedsvej 4  
DK-2970 Hørsholm

*declare under our sole responsibility that the product:*

Product name: GRX Online Sensor  
Trade name: GRX Online Sensor  
Type or model: All types pursuant to the referenced trade name

*to which this attestation relates is in conformity with the essential requirements and other relevant requirements of ICES-003:2016*

*The product is verified according to:*

*ICES-003:2016 (Class B)*

*The equipment is accredited safety test with the internationally harmonized safety standard:*

IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013

Supplementary information:

-

Technical file held by the undersigned.

Place and date of issue (of this SDoC): Hørsholm 10-July-2018

Signed by or for the manufacturer:



.....  
(Signature of authorized person)

Name (in print):  
Susan Bonde  
QA Manager, Product Division, Electronics & Microelectronics

# Declaration of Conformity (DoC)

Unique Identification of this DoC: 80\_GRX Online Sensor\_EU\_DoC\_001

*We,*

FORCE Technology  
Venlighedsvej 4  
DK-2970 Hørsholm

*declare under our sole responsibility that the product:*

Product name: GRX Online Sensor  
Trade name: GRX Online Sensor  
Type or model: All types pursuant to the referenced trade name.  
Serial / Batch no.: From Serial number: 100 (incl.)

*to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the:*

*Electromagnetic Compatibility (EMC) Directive (2014/30/EU)*

EN 61326-1:2013, Industrial level, Class A  
EN 61000-3-2:2014  
EN 61000-3-3:2013

*Low Voltage (LVD) Directive (2014/35/EU)*

EN 61010-1:2010 (IEC 61010-1:2010, AMD:2016)  
EN 62471:2008

*Restriction of the use of certain hazardous substances (RoHS) directive 2011/65/EU*

Assessment of components datasheets

Supplementary information: -

Technical file held by the undersigned.

First year of CE marking: 2018

Place and date of issue (of this DoC): Hørsholm 10-July-2018

Signed by or for the manufacturer:



.....  
(Signature of authorized person)

Name (in print):

Susan Bonde  
QA Manager, Product Division, Electronics & Microelectronics



# US Attestation of Conformity (AoC)

Unique Identification of this AoC: 80\_GRX Online Sensor\_AoC\_001

*We,*  
FORCE Technology  
Venlighedsvej 4  
DK-2970 Hørsholm

*declare under our sole responsibility that the product:*

Product name: GRX Online Sensor  
Trade name: GRX Online Sensor  
Type or model: All types pursuant to the referenced trade name

*to which this attestation relates is in conformity with the essential requirements and other relevant requirements of 47 CFR FCC Part 15.*

*The product is exempted from other specific FCC rule parts than the general rule parts 15.5 and 15.29 pursuant to specific rule part 15.103(c), as it is intended solely for use as industrial test equipment. However, the product is verified according to the specific rule parts:*

47 CFR Part 15B, subpart 15.107 (Class B)  
47 CFR Part 15B, subpart 15.109 (Class B)

*The equipment is accredited safety test with the internationally harmonized safety standard:*

IEC 60950-1:2005 (Second Edition) + Am 1:2009 + Am 2:2013

Supplementary information:

-

Technical file held by the undersigned.

Place and date of issue (of this AoC): Hørsholm 10-July-2018

Signed by or for the manufacturer:



.....  
(Signature of authorized person)

Name (in print):  
Susan Bonde  
QA Manager, Product Division, Electronics & Microelectronics

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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## GRX Online usage

GRX Online is an industrial sensor for continuously monitoring of retroreflective properties of sheeting materials at the production line. Retroreflective sheeting materials are used for traffic signs, high visibility safety clothing, license plates and, conspicuity materials.

## What does GRX Online measure?

GRX Online measures the value  $R_A$  (coefficient of retroreflected luminance at night).

$R_A$  is an important factor in the on-site quality control of road traffic signs.

## International measurement standards

The GRX Online measures the retroreflection and calculates  $R_A$  according to international CEN and ASTM standards. The instrument complies with the following European and US standards:

- EN 12899: Fixed, Vertical Road Traffic Signs, part 1-5  
Part 1: Fixed Signs & Part 4: Factory Production Control
- EN 20471: High-Visibility Clothing - Test Methods and Requirements
- ASTM E 1709: Standard Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer at a 0.2 degree Observation Angle
- ASTM E 2540: Standard Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer at a 0.5 degree Observation Angle
- ASTM E 1809: Standard Test Method for Measurement of High-Visibility Retroreflective-Clothing at a 0.2 degree Observation Angle and an Entrance Angle of -4 degree (discontinued).



## Overview of GRX Online

The GRX online sensor measures Ra values for a given entrance angle for seven observation angles.

The GRX online sensor has a built in entrance angle of either -4 degrees (ASTM type) or 5 degrees (CEN type). The observations angles are 0.2, 0.33, 0.5, 0.7, 1.0, 1.5 and 2.0 degrees. All observations angles are measured simultaneously. The sensor measures all types and colors of retroreflective materials, when calibrated with one single white retroreflective standard with known  $R_A$ . A calibration standard can be supplied as an option by DELTA.

## Standard delivery

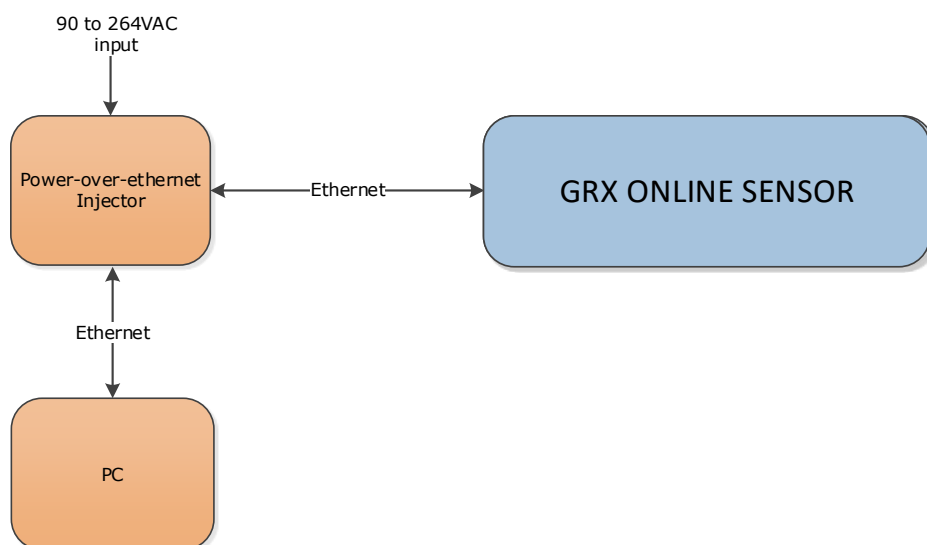
- 1 pcs GRX Online Sensor.
- 1 pcs Power-over-ethernet injector.
- 1 pcs USB memory stick with PC control software and user guide.

## Connecting the sensor

The online sensor is powered through the ethernet cable.

- Connect the sensor unit to the POE-injectors "OUT" socket\*).
- Connect the POE-injector "IN" socket to the PC\*).
- Connect the POE-injector power cable to an electrical outlet.

*\*) Ethernet cables must be CAT5 or better.*



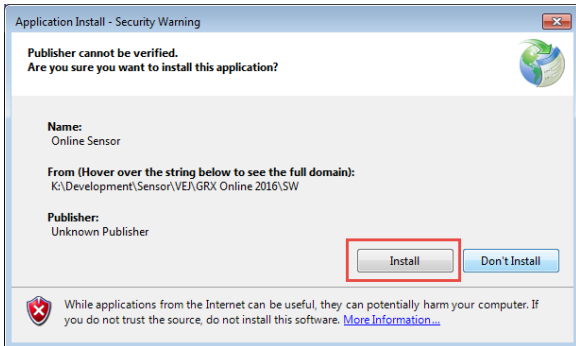
When the sensor is powered correct the green LED on the rear cover plate will be flashing slowly (1 Hz).

## Mounting the sensor in the production line

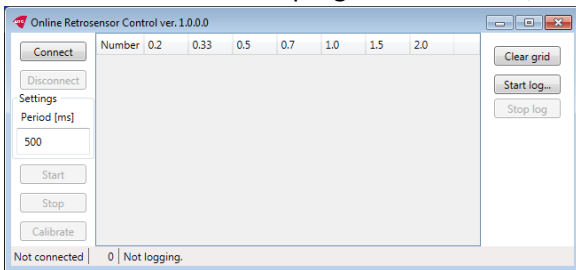
Mount the sensor so the black end cover (with the measurement window) is parallel to the sheeting and with approximately 100 mm. The illumination angle (-4° or +5 degrees) is determined by the internal optics. See the section [Mechanical drawing](#)

## Software installation

Double-click the “setup” file (eg. on the enclosed USB stick). When the install window shows up click “Install”



After a few seconds the program is installed, and the program starts up:



### Program location:

The program is installed in the default Windows program location:

`C:\Users\<Your user name>\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\DELTA`

Furthermore, a short cut is placed on the Windows desktop.

## Connecting to the sensor to the PC

### General

The sensor communicates over ethernet. The computer running the control software must be configured to access the sensor.

#### **Note:**

If the ethernet port on the pc is used for other purpose you can purchase an “USB to ethernet adaptor” to get an ethernet port

The sensor is configured with a fixed IP address on the private subnet 10.201.201.0.

Sensor IP address (fixed): 10.201.201.5

The control computer should be configured with a fixed IP address on the same subnet.

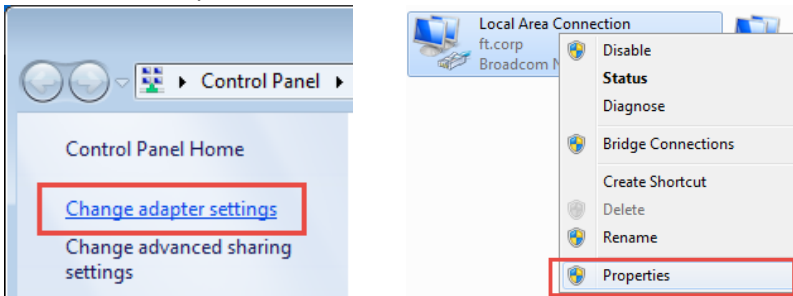
The proposed network configuration is this:

Fixed IP address: 10.201.201.2

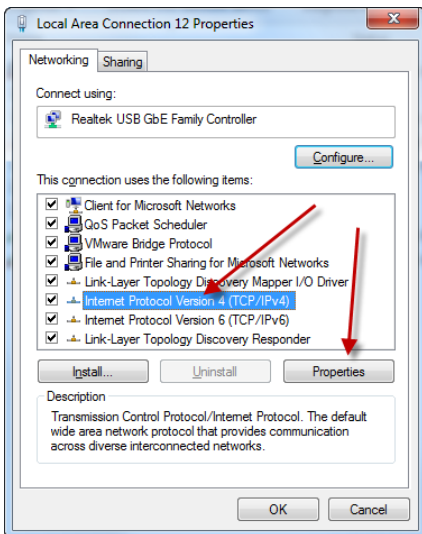
Netmask: 255.255.255.0

## Configuring the network adapter

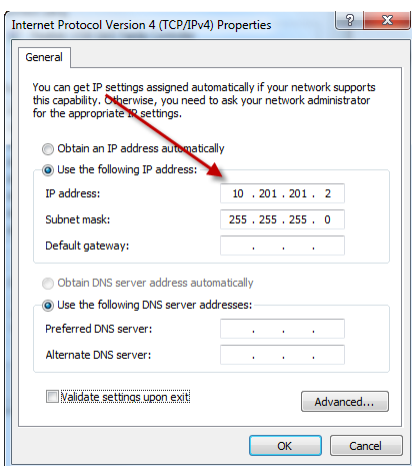
Open the Control Panel and start “Network and Sharing center”, then select “Change adapter settings” and then select “Properties”



Select “Internet Protocol Version 4 (TCP/IPv4)” and click “Properties”



Select “Use the following IP address:”



Enter IP address: 10.201.201.2

Enter subnet mask: 255.255.255.0

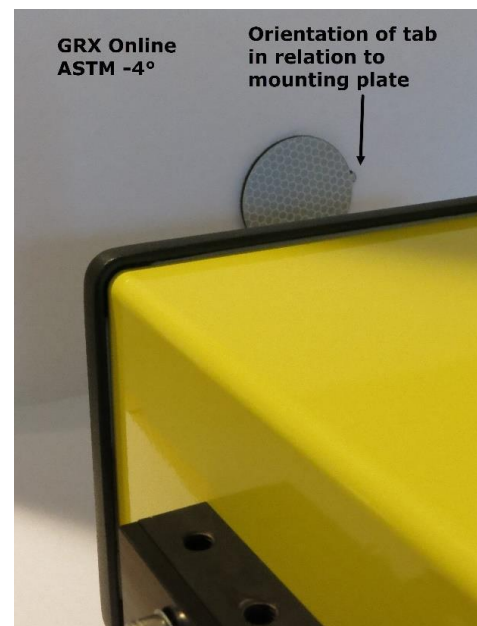
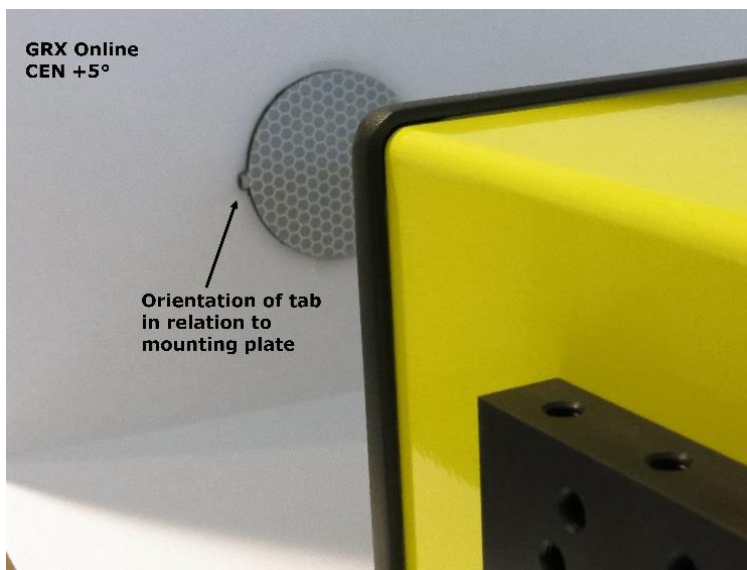
Click “OK” and “Close”

## Calibration procedure

The sensor does not compensate for the distance to the sheeting. Therefore, it is necessary to perform the calibration with the calibration target in the actual measuring distance.

DELTA will be able as an optional feature to deliver a calibration target if the user does not have an own calibration target. If the DELTA calibration target is used this is the specific instruction:

Place the calibration target in the same distance as the sheeting. The DELTA calibration target is a circular type with a tap. Depending of the measurement angle of the GRX Online sensor the tap must be orientated correct. On the  $+5^\circ$  unit the tap must point **towards** the mounting plate / bracket. On the  $-4^\circ$  unit the tap must point **away** from the mounting plate / bracket.

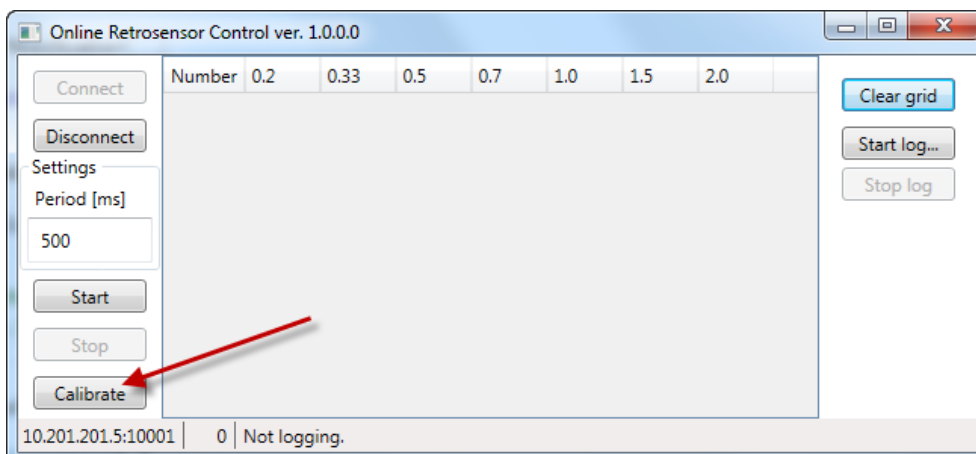


If the user's own calibration target is used, this is the instruction: Place the calibration target in the same distance as the sheeting.

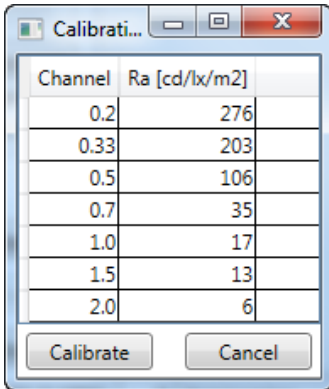
Start streaming to help position the calibration target. The illuminated circle should be in the center of the calibration target.

Stop streaming when the target is positioned correctly.

Click "Calibrate" and enter the calibration values for each observation angle.

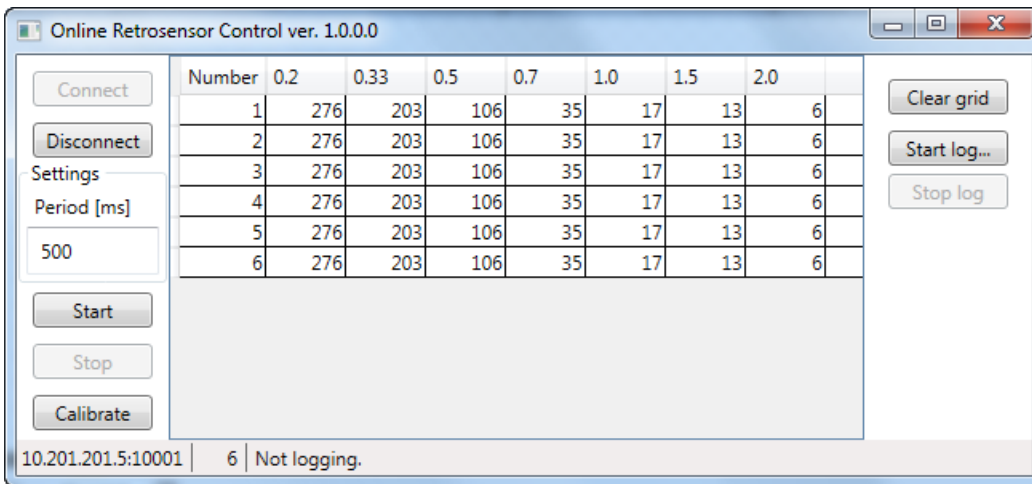


Enter the calibration values in the calibration window:



Click “Calibrate” to perform the calibration. Click “OK” to close the confirmation window.

Start streaming while the calibration target is still in place to verify that the measured data matches the values entered.



## Start/stop measuring

Stream: Measurement period must be at least 200 milliseconds. The actual measuring time is approximately 50 milliseconds shorter.

In general, the lower measuring times result in lower precision, i.e. greater variations in the measurement results.

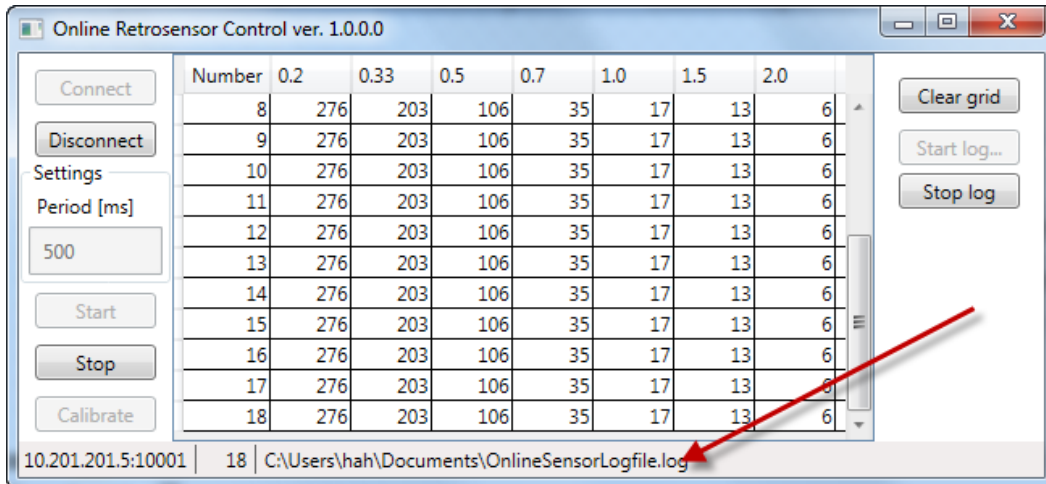
When the sensor is measuring the green LED on the rear cover plate will be flashing quickly (10 Hz).

The measurement grid scrolls automatically when a measurement is received. The grid can hold a maximum of 50.000 measurements. When the limit is reached, the oldest measurements are removed from the grid.

## Start/stop logging

Select “Start log” to start logging measurements to a file.

The current logfile is shown in the status bar:



If a file with the same name already exists, the measurement data will be appended.

The log file is in TAB-delimited ASCII format.

Example:

```

;Number      Timestamp      Ra02    Ra033    Ra05    Ra07    Ra10    Ra15    Ra20
8           2016-11-01 12:54:05.391  276     203     106     35      17      13      6
9           2016-11-01 12:54:05.890  276     203     106     35      17      13      6
10          2016-11-01 12:54:06.390  276     203     106     35      17      13      6

```

## Appendix A: Specifications

### Optical characteristics

|                                     |                                               |
|-------------------------------------|-----------------------------------------------|
| Measurement aperture:               | Ø25 mm / 1 inch                               |
| Observation angles:                 | 0.2°, 0.33°, 0.5°, 0.7°, 1.0°, 1.5°, 2.0°     |
| Entrance angle (ASTM Type):         | -4° (when mounted parallel to the web)        |
| Entrance angle (DIN Type) Optional: | +5° (when mounted parallel to the web)        |
| Distance from sensor to web:        | 0 - 200 mm / 0 - 7.9 inch                     |
| Reading range:                      | 0 - 2000 cd·lx <sup>-1</sup> ·m <sup>-2</sup> |
| Calibration:                        | User-supplied calibrated standard             |
| Light source angular aperture:      | 0.1°                                          |
| Receptor angular aperture:          | 0.1°                                          |
| Light source:                       | Illuminant »A«                                |
| Receptor sensitivity:               | Eye corrected                                 |

### Standards

|                    |                                 |
|--------------------|---------------------------------|
| ASTM:              | E1709 & E2540                   |
| DIN:               | 67520 & EN12899-1               |
| FCC:               | FCC part 15, Subpart B, Class A |
| Electrical safety: | IEC 61010-1                     |

### Electrical characteristics

|                              |                                |
|------------------------------|--------------------------------|
| Measurement time (variable): | 0.2 - 2 seconds / 5Hz - 0.5 Hz |
| Power:                       | POE (Power Over Ethernet)      |
| Power consumption:           | < 10W                          |
| Data connection:             | Ethernet 10/100                |

### Environmental characteristics

|                        |                                |
|------------------------|--------------------------------|
| Operation temperature: | 0°C to +40°C (32°F to 104°F)   |
| Storage temperature:   | -10°C to +60°C (14°F to 140°F) |
| Humidity:              | < 85%, Non-condensing          |

### Mechanical characteristics

|                   |                   |
|-------------------|-------------------|
| Length:           | 270mm/10.6 inches |
| Width:            | 112 mm/4.4 inches |
| Height:           | 165 mm/6.5 inches |
| Weight:           | 2.5 kg/5.5 lbs    |
| Housing:          | Aluminum          |
| Structural parts: | Aluminum          |

# Mechanical drawing

